

AMENDMENTS TO THE CLAIMS

1. (Withdrawn) A process for manufacturing a printed circuit board with embedded capacitors therein, comprising the steps of:

- i) forming a plurality of inner via holes on predetermined regions of a non-copper clad laminate;
- ii) filling the via holes with a capacitor paste;
- iii) providing copper foil layers on both upper and lower surfaces of the capacitor paste, respectively;
- iv) forming predetermined dry film patterns on the copper foil layers;
- v) exposing to light and developing the dry film patterns to form top electrodes, bottom electrodes and signal circuit patterns;
- vi) laminating resin coated copper (RCC) layers to the top electrodes, the bottom electrodes and the signal circuit patterns;
- vii) forming predetermined outer via holes and through-holes in the resin coated copper layers; and
- viii) plating the inner walls of the outer via holes and the through-holes.

2. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the non-copper clad laminate is an FR-4 insulator.

3. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, further comprising the step of drying to cure the filled capacitor paste.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS^{PLLC}
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

4. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 3, wherein the capacitor paste is dried in an oven drier at 150~170 °C for 30 minutes.

5. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 3, further comprising the step of polishing to smooth overfilled capacitor paste so as to adjust the cured capacitor paste to a uniform height.

6. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 5, wherein the capacitor paste is smoothed using a ceramic buff.

7. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the via holes are filled with the capacitor paste using a screen-printing manner.

8. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the capacitor paste is a composite of high dielectric BaTiO₃ ceramic powders having a dielectric constant of 1,000~10,000 and a thermosetting epoxy resin or polyimide.

9. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the capacitor paste is a polymer ceramic composite having a dielectric constant of about 80~90, the polymer ceramic composite being obtained by homogeneously dispersing the BaTiO₃ powders composed of coarse powders having a particle diameter of 0.9μm and fine powders having a particle diameter of 60nm (bimodal form) in the epoxy resin in a volume ratio of 3:1~5:1.

10. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the copper foil layers are subjected to electroless plating or electro plating.

11. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the resin coated copper (RCC) layers are laminated by a build-up process.

12. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the via holes are formed using a laser drill.

13. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the through-holes are formed using a mechanical drill.

14. (Withdrawn) The process for manufacturing a printed circuit board with embedded capacitors therein according to Claim 1, wherein the outer via holes and the through-holes are subjected to electroless plating.

15. (Currently amended) A printed circuit board with embedded capacitors therein, comprising:

- a) a non-copper clad laminate having a plurality of inner via holes formed on its predetermined regions, wherein the via holes define a perimeter;
- b) a capacitor paste filled in the plurality of inner via holes formed on the non-copper clad laminate, wherein the capacitor paste fills the via holes to the perimeter of the via holes and throughout the height of the via holes;

c) copper foil layers provided on both upper and lower surfaces of the capacitor paste and the copper clad laminate, the copper foil layers including forming top electrodes, bottom electrodes and signal circuit patterns, wherein a top electrode formed by a copper foil layer contacts the top of the capacitor paste at least over the area defined by the perimeter of the via hole and a bottom electrode formed by a copper foil layer contacts the bottom of the capacitor paste at least over the area defined by the perimeter of the via hole and wherein the signal circuit patterns are formed by a copper foil layer juxtaposed next to the top and bottom surfaces of the copper clad laminate at the height of the top and bottom electrodes of the capacitor;

d) resin coated copper (RCC) layers laminated to the top electrodes, the bottom electrodes and the signal circuit patterns;

e) predetermined outer via holes and through-holes formed in the resin coated copper layers; and

f) plating layers plated in the inner walls of the outer via holes and the through-holes.

16. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the non-copper clad laminate is an FR-4 insulator.

17. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the via holes are filled with the capacitor paste using a screen-printing manner.

18. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the capacitor paste is a composite of high dielectric BaTiO₃ ceramic powders having a dielectric constant of 1,000~10,000 and a thermosetting epoxy resin or polyimide.

19. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the capacitor paste is a polymer ceramic composite having a dielectric constant of about 80~90, the polymer ceramic composite being obtained by homogeneously dispersing the BaTiO₃ powders composed of coarse powders having a particle diameter of 0.9μm and fine powders having a particle diameter of 60nm (bimodal form) in the epoxy resin in a volume ratio of 3:1~5:1.

20. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the resin coated copper (RCC) layers are laminated by a build-up process.

21. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the outer via holes are formed using a laser drill.

22. (Original) A printed circuit board with embedded capacitors therein according to Claim 15, wherein the through-holes are formed using a mechanical drill.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS^{PLLC}
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100